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# ***FEATURE ARTICLE***

## **The Defense Mapping Agency**

**By**

**Richard A. Tanzillo**

“The want of accurate maps has been a grave disadvantage to me. I have in vain endeavored to procure them, and have been obliged to make shift with such sketches as I could trace out of my own observations and that of gentlemen around me. I think if gentlemen of known character and probity could be employed in making maps (from actual surveys) it would be of the greatest advantage.”

General George Washington, 1777

### **INTRODUCTION**

This article focuses on the mission, organization and functions of the Defense Mapping Agency (DMA) as the recognized world leader in mapping, charting, and geodetic technology. It discusses the Agency's current and future strategy for effectively supporting the United States' international focus on threats which have become more probable and less predictable.

### **ROLE IN SECURITY ASSISTANCE**

The Defense Mapping Agency's role in security assistance and in international programs encompasses many areas, including bilateral and coproduction programs, technology transfer, peacekeeping operations, systems and equipment leases and loans, Foreign Military Sales and training. OPERATIONS DESERT SHIELD and DESERT STORM and the Bosnian peace talks at Wright-Patterson Air Force Base provided an extraordinary opportunity for DMA to successfully provide mapping support to our Military Services, our allies, and to international negotiators.

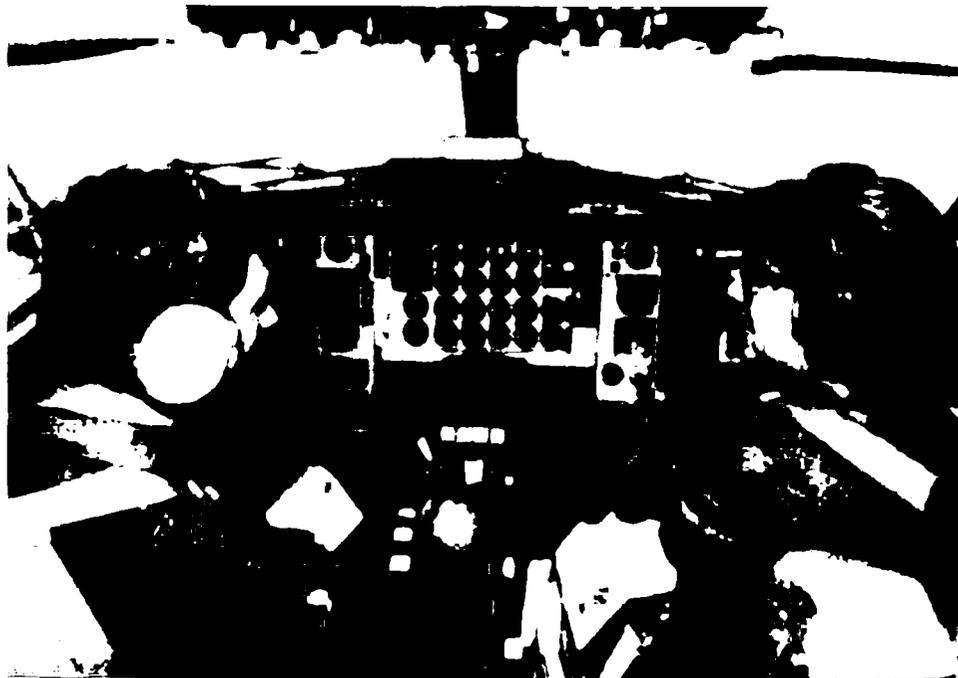
### **NATIONAL SECURITY STRATEGY**

The world is constantly changing at the hands of man and nature. National security threats, which once seemed well defined and predictable, have been transformed into threats which are more widespread and uncertain. The U.S. National Military Strategy requires that DMA must meet this new environment with fewer resources and less time to respond to its customers' needs.

The sophisticated weapon systems integral to the operations of all American Armed Forces simply cannot function without the digital data generated by DMA. While millions of paper maps and charts are produced and distributed, it is in the exploding technology of “digitization” that DMA contributes ever more significantly to the Armed Forces operational success.

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The vast array of modern weapons systems fielded today and those planned for the future require large quantities of Global Geospatial Information and Services (GGI&S). GGI&S, as defined, is a "concept for collecting, storing, managing, disseminating, and exploiting geospatial information." Geospatial information is geographic/cartographic data that is accurately referenced to precise locations on the Earth's surface and includes digitized maps and charts, attributed centerline data, precisely controlled imagery, and timely navigation safety information. The data is produced by multiple sources (government, contractor, and foreign co-produced) to a common, interoperable data standard.



DMA Products In Use By U.S. Military Forces

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Weapon systems which require GGI&S (e.g., digital terrain elevation data, compressed ARC digitized raster graphics, and digital point positioning data bases) include the Air Force's Mission Support System (AFMSS), the Navy's Tactical Aircraft Mission Planning System (TAMPS), and the Army's Aviation Mission Planning System (AFMSS) in support of key mission planning programs.

DMA, through its liaison offices and Customer Support Teams, continually works with its national and international customers to define present and future requirements and adapt existing data to meet new requirements. DMA concurrently works with U.S. and Allied military forces to ensure interoperability of data and systems essential to joint and combined operations.

## HISTORICAL PERSPECTIVE

United States military map making dates back to June 1775 with the appointment of General George Washington to command the Continental Army. A quarter of a century before, he had surveyed and mapped much of the Shenandoah Valley in Virginia. In July 1777, Congress passed a resolution that: "General Washington be empowered to appoint Mr. Robert Erskine . . . geographer and surveyor of the roads, to take sketches of the country, the seat of war. . . ."



General George Washington, Commander of the Continental Army

In 1838, Congress established the Corps of Topographic Engineers as a separate entity and named Colonel John J. Abert, who was then chief of the Topographic Bureau, as its commander. In 1842, Congress appropriated funds for the U.S. Naval Observatory and Hydrographic Office on land that George Washington had originally proposed as the site of a national university, near the present State Department. In 1918, the Hydrographic staff

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produced the first United States aviation charts used by World War I fliers. During World War II, our nation's relatively small mapping and charting components in the Army, Navy, and Air Corps underwent rapid expansion to meet the global requirements of that conflict. In 1942, the Army Map Service was established in Brookmont, Maryland. The Army Air Force Aeronautical Chart Service evolved from an aeronautical chart plant and was established in St. Louis, Missouri, in April 1944.



The Army Force Aeronautical Chart Plant St. Louis, Mo, Circa 1945

As a result of a Presidential Blue Ribbon Study Committee's recommendations to consolidate all mapping, charting, and geodetic activities in a new, centralized agency, President Nixon directed establishment of the Defense Mapping Agency in 1971. DMA became operational on 1 July 1972 as a separate defense agency, reporting to the Secretary of Defense, but taking operational direction from the Joint Chiefs of Staff.

## DMA MISSION AND ORGANIZATION

The DMA mission statement outlines the purpose of the organization and why it exists: "The Defense Mapping Agency will provide global geospatial information and services to support and advance national security objectives."

As a major combat support agency of the Department of Defense (DoD), DMA is under the direction and control of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD/C31). The DMA Director is also responsible to the Chairman of the Joint Chiefs of Staff for meeting the operational needs of the war fighter community.

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The DMA Director, Major General Philip W. Nuber, USAF, manages all DoD Mapping, Charting, and Geodetic (MC&G) resources and activities, including research, development, test, and evaluation requirements for new and emerging systems. DMA represents DoD in all national and international meetings on GGI&S standardization activities.

DMA provides the war fighter with considerable leverage through timely, accurate GGI&S data. Paper maps and charts, as well as digital data, are provided to ensure the highest state of operational readiness of American military forces and their sophisticated navigation, weapons, and command and control systems.

The success of our forces and the protection of their lives on the battlefield depends upon reliable geospatial information from DMA. The Agency combines military intelligence and geographic information to give our forces the decisive edge. DMA is one of the major sources of worldwide mapping products for U.S. and Allied Forces.

In support of military operational needs, the Agency annually produces more than 26 million copies of military maps and charts; digitizes some 4.5 million square nautical miles of the Earth; develops more than 450,000 square nautical miles of Point Positioning Data Bases; and locates 13,000 precise target points. These GGI&S products are produced by and distributed from over 57 DMA production and storage sites worldwide, using mapping information and data received from sources throughout the world.

In addition to the products provided to our military forces, DMA also produces and provides nautical charts and marine navigational data to merchant marine forces and private vessel operators. Aeronautical charts, digital data, flight publications, space mission charts, and a wide spectrum of technical data about the Earth and its aerospace environments are produced and made available for air navigation on a worldwide basis.

DMA operates under a total annual budget appropriation of \$835 million (Fiscal Year 1995). Approximately 55 percent of DMA's current work force of 7,197 civilians and 248 military personnel come from scientific career fields such as cartography, geodesy, geology, astronomy, oceanography, remote sensing, photogrammetry, and optics. Backgrounds in civil and electronic engineering and the computer sciences are also represented.

DMA has repeatedly mobilized this rich, diverse talent in response to a wide array of urgent requirements of the U.S. Military Services and international customers: from road maps for humanitarian operations in Rwanda and Somalia, to survival charts carried in the vest pockets of Allied pilots over Bosnia.

## **DMA REINVENTED**

Mappers know the world does not stand still. Nor can an organization like the Defense Mapping Agency. DMA recognizes that ultimately, it is the customer who gives DMA its reason for existence, i.e., satisfying customer requirements for products and/or services that meet or exceed expectations. To ensure customer driven quality and operational performance values are a continual, enduring, integral part of its organizational planning, requirements, and evaluation, DMA instituted a major reinvention effort to align the organizational structure with its business processes. In so doing, DMA has been able to reengineer the processes to further capitalize on the strength of its work force and the contributions it makes in support of national security objectives.

## Organizational Structure

Throughout the 1980's, DMA's four major production components were served by independent quality assurance offices. DMA began implementing a Total Quality Management approach as the decade closed and, began activating Process Improvement Offices at the Headquarters and at each of its four major production components on 1 October 1990. In 1992, the DMA-wide Quality Council was established which brought about significant changes in the Agency's management style, evolving from single issue-owners to a more efficient and responsive organization.

In September 1994, as industry and the military moved to more virtual operations of the computer age, DMA recognized the need to take the next step in the evolutionary process by creating a more responsive organization designed around its core business processes and governed by a board of directors who collectively manage the quality aspects. DMA established a Reinvention Task Force to develop a Concept of Operations, which was approved and implemented, and became operational in July 1995. The reinvented DMA structure is illustrated in Figure 1.

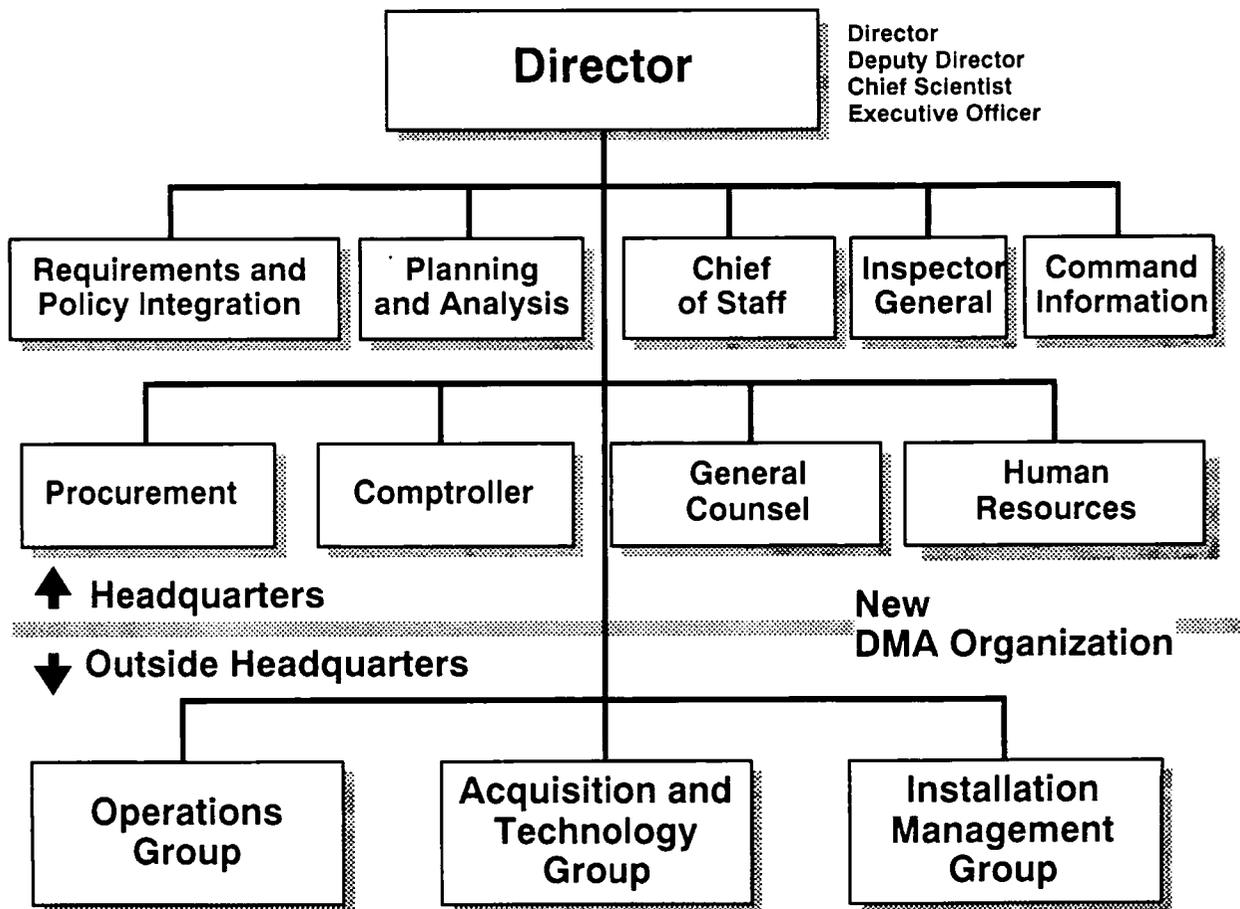


Figure 1. Defense Mapping Agency Organizational Structure

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### Inside Headquarters

Planning and Analysis is responsible for the DMA strategic planning process, for managing and advocating metrics, overseeing performance improvement, and managing the Executive Information System.

Requirements and Policy Integration provides advocacy for customers, coordinates the prioritizing of all internal and external requirements for production, technology, and infrastructure and has extensive responsibility for policy development.

### Outside Headquarters

The Operations Group manages the production process and assists customers in all actions—from identifying requirements to delivering products and services.

The Acquisition and Technology Group oversees development and engineering for the Agency and provides technical services.

The Installation Management Group provides site management and base support for site security, administration, supplies, health, safety, and visual information services.

### **Strategic Goals and Objectives**

The new DMA is focused on eight strategic goals and objectives which represent the greatest potential for shaping DMA's future:

Goal No. 1: Improve DMA's ability to satisfy customers' needs through proper integration of related government and private sector activities.

Goal No. 2: Be responsive to customers' needs by providing access to the right global geospatial information and services anywhere at anytime.

Goal No. 3: Provide global leadership in advocating, directing, and exploiting technology to enhance DMA's readiness and responsiveness.

Goal No. 4: Create a learning environment that allows all individuals to obtain the skills necessary to readily adapt to change.

Goal No. 5: DMA core values will be consistently reflected in daily actions throughout the organization.

Goal No. 6: Reduce the cost and cycle times of all DMA processes while improving quality and service.

Goal No. 7: Provide a wholesome quality of life and work environment.

Goal No. 8: Align the DMA international program with the National Security Strategy and the National Military Strategy.

Customer focus and satisfaction are championed in the following ways:

- On-site DMA representatives at major customer sites

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- Visits by the DMA Director and Senior Staff to the customer
  - Facilitation of new international agreements
  - Development of processes to respond to sophisticated requirements
  - Teaming with contract suppliers

DMA's successful reinvention effort was formally recognized by Vice President Al Gore's National Performance Review (NPR) for putting customers first, cutting red tape, empowering employees and getting back to basics. The Vice President's Hammer award was presented to DMA by Robert Stone, NPR Executive Director, on January 29, 1996.



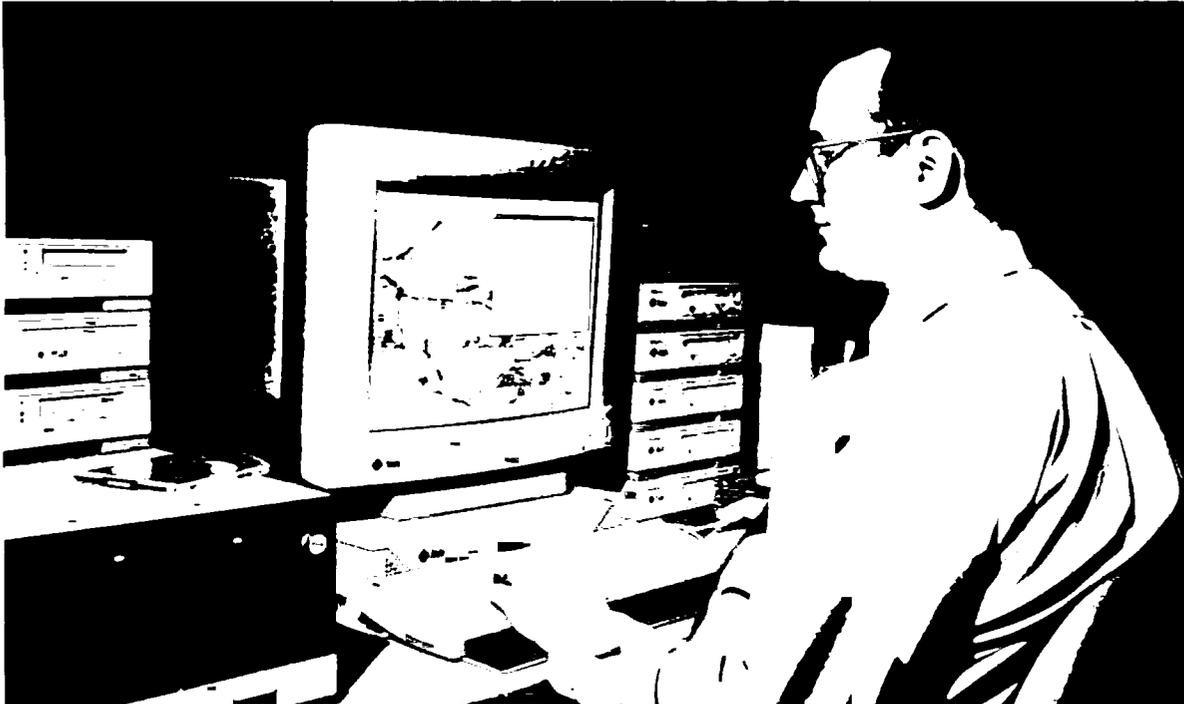
The Navy's Tactical Aircraft Mission Planning System (TAMPS)

### **Laws or Regulations Relating to the Defense Mapping Agency**

The Public Laws and regulations that outline DMA's mission and functions also reflect the unique nature of DMA. While DMA principally has a military mission, it has important statutory responsibilities to the public as well.

- 10 U.S.C. Chapter 167 establishes DMA authorities and directs the agency to provide accurate and inexpensive nautical charts, sailing directions, books on navigation, etc. for the use of all vessels of the United States and of navigators generally, chartering a public as well as military mission. Chapter 167 also specifically authorizes DMA to exchange or furnish mapping, charting and geodetic data, supplies and services to a foreign country or international organization pursuant to an agreement for the production or exchange of such data.

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- 44 U.S.C. Chapter 13 authorizes DMA to print notices to mariners, light lists, sailing directions, bulletins, and other publications in support of the safety of navigation.
  - A Department of State Circular 175 delegation provides authority for DMA to negotiate and conclude MC&G bilateral agreements with foreign nations.
  - DoD Directive 5105.40 charters DMA's mission and function within the Defense Department and delegates international authorities to DMA.



Viewing Arc Digitized Raster Graphics (ADRG)

## SECURITY ASSISTANCE PROGRAMS

Security assistance involves foreign funded and U.S. funded cooperative programs which give allied nations the means for defending themselves from aggression and the capability to fight along with U.S. forces in a coalition effort. The Defense Mapping Agency's participation in security assistance covers a broad spectrum of activities, and is comprised of the following major programs: international exchange agreements; coproduction with international partners; Foreign Military Sales (FMS); Foreign Military Financing; lease and loan of mapping, charting and geodetic equipment to foreign military agencies and international organizations; management of DoD activities to support geographic names standardization and international boundaries representation; foreign visitor and personnel exchange; and International Military Education and Training. Additionally, DMA supports the United States Mission to the United Nations in its peacekeeping operations by responding to Letters of Assist from eligible countries for DMA maps and charts. All are driven, primarily, by the International Agreements program, which assists foreign nations in developing, modernizing, enhancing, and improving their mapping capabilities.

The DMA mission includes the acquisition of foreign-produced GGI&S data and products and the exercise of management control over coproduction activities in compliance with

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existing international agreements. The International Operations Division (OGI) is located within the Operations Group and is the focal point for all DMA international operations. OGI provides technical support and arranges appropriate training for international partners and serves as the DMA advocate for international geospatial exchange standards. OGI is staffed by 53 personnel stationed in the Continental U.S. (CONUS) and 46 personnel outside CONUS. It is organized into three regional branches (EUCOM/CENTCOM, ACOM/SOUTHCOM, and PACOM/JCS) supported by the International Implementation Branch and International Strategy Office.

DMA's international efforts have been instrumental in the acceptance of a geocentric reference system (i.e., the World Geodetic System 1984 (WGS-84)) as a global standard. Through participation in international seminars, forums, and working groups, DMA has successfully promoted product standardization within the international community. DMA has been a leader in assisting other nations in the transformation of native produced data to a geocentric reference system. DMA has also been a key member of the Digital Geographic Information Working Group working with other nations toward the development and implementation of the Digital Geographic Information Exchange Standard (DIGEST) for digital data and the development of product and system standardization. DMA is also leading several international co-production working groups for the production of digital data such as digital terrain elevation data, digital feature analysis data and Vector Map (VMap) Level I products.

In coordinating all international Geodesy and Geophysics programs, DMA has assisted in many Global Positioning System campaigns resulting in more accurate national control networks in host countries. Notable achievements include:

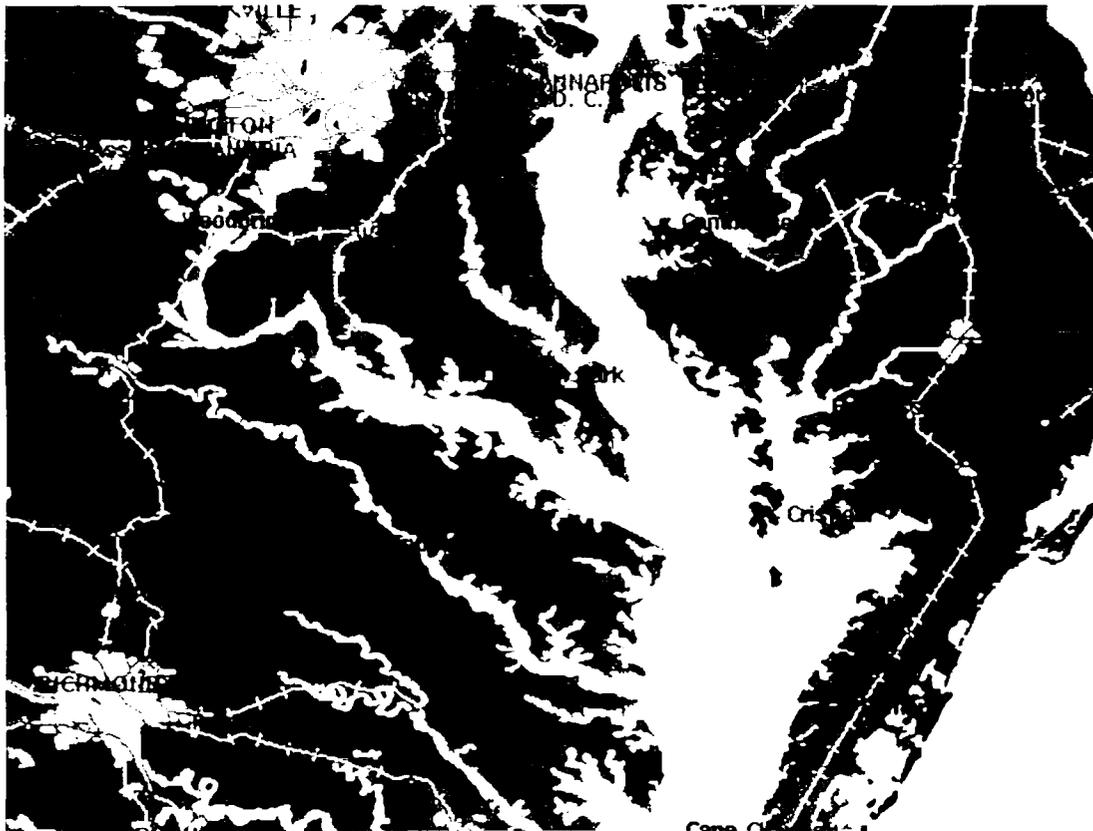
- The establishment of a network of high accuracy horizontal control stations in the Republic of Korea to allow the conversion of existing maps and charts from the Korean local datum to WGS-84.
- The establishment of a Global Positioning System (GPS) satellite tracking station in Beijing, the seventh in the global net of monitor stations that provide data to DMA in support of GPS precise orbit computation.

DMA's high accuracy geodetic surveys and extensive collection of surface gravity data with many countries support its collaborative effort with NASA on the state-of-the-art Earth Gravity Model (EGM) and improved global vertical reference System.

### **International Agreements and Coproduction**

As a GGI&S world leader, DMA is able to assist the international community in developing its GGI&S capabilities. In return, DMA benefits through the purchase and exchange of information, joint production, and improved international relations. A key measure of DMA's success in this arena is the number of formal agreements that DMA has established with other nations. Through international agreements with 114 countries, territories and political entities, DMA has acquired products enabling the Agency to redirect valuable resources toward unsatisfied needs.

DMA's pursuit and use of international and coproduction partnerships has provided access to massive MC&G holdings created by foreign coproducers and led to the exchange and purchase of information and joint production to meet both U.S. and foreign requirements. In addition, international agreements enable DMA to maintain an overseas presence, permitting awareness of and access to production capabilities in Latin America, Europe, and Asia.



Digital Chart Of The World (DCW)

Native produced maps and charts are a valuable source of information and, in many cases, substitute for DMA standard products. Through international agreements, DMA has established partnerships with some newly independent states of the former Soviet Union and some emerging democracies of Eastern Europe. As a result, DMA now has access to airfield information in areas previously denied, e.g., Estonia, Latvia, Lithuania, Poland, Czech, and Slovak Republics and Romania. In the Pacific, DMA is working on new cooperative agreements with Australia, Japan, and Malaysia; new digital exchanges with Thailand; a new digital coproduction agreement with South Korea; new geopositioning surveys in China, Thailand, and the Philippines; and DMA is providing support for the Cambodian mine-clearing effort.

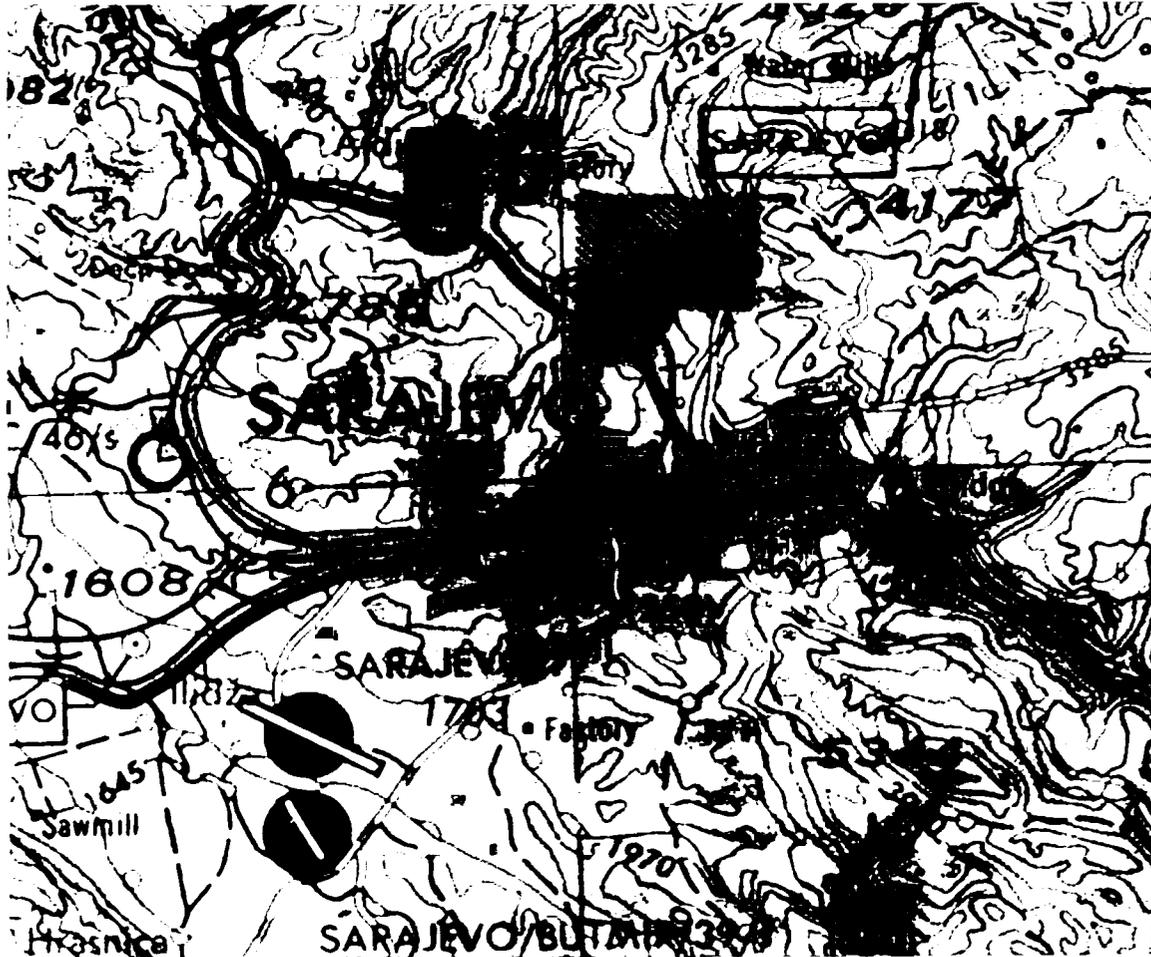
Through coproduction with and data collection by countries such as Bolivia, Columbia, Ecuador, Paraguay, and Peru, DMA produces a wide range of Topographic Line Maps and Riverine Route Maps for use by counternarcotics enforcement officials. DMA also actively assists nations in developing and modernizing the infrastructure and capabilities of their mapping agencies. An example is DMA's support to Thailand which enables the Thais to produce maps in the "Golden Triangle" area of southeast Asia for use by the Drug Enforcement Agency.

### Foreign Military Sales

The expertise that earmarks DMA as a leader in GGI&S is of great import and value to the United States in the international arena. The Foreign Military Sales Program provides

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government-to-government channel for selling U.S. defense products, services, and training, and for standardizing mapping throughout the world. DMA's extensive list of products and services are purchased by over 40 countries, either through annual subscription, blanket order or itemized, defined order FMS cases. These include joint operational graphics, detailed topographic line maps, image maps, bathymetric contours of the ocean floor, tactical pilotage charts, digital chart of the world on CD-ROM, city graphics, safety of navigation products (harbor, approach and bathymetric charts), and a comprehensive series of worldwide airfield flight information publications.



Compressed Arc Digitized Raster Graphics (CADRG)

Through FMS, DMA provides technical support, systems engineering, technical advisory, and training assistance to nations developing or modernizing their mapping capabilities. Since the early 1980's, the DMA participates in the FMS program has grown dramatically from less than \$1 million to a total program value of \$360 million as of the close of FY 1995.

FMS complements the international exchange agreements and coproduction programs in a number of significant ways. Through FMS, DMA assists an ever expanding base of countries in developing and modernizing their GGI&S capabilities. DMA systems engineers and technical advisory (SETA) personnel have conducted extensive studies, analyses, and

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evaluations of the current GGI&S capability of many foreign governments and provided recommendations for their development, enhancements, and upgrade. Based upon these recommendations and comprehensive reports, many foreign governments have availed themselves of DMA's expertise by utilizing FMS to procure mapping and charting hardware and software systems and equipment, integration, installation, training, maintenance, and spare parts provisioning.



Digital Point Positioning Data Bases (DPPDB)

Consequently, in providing security assistance through FMS, the products DMA receives through resultant exchange agreements are of exceptionally high quality and accuracy, and contribute to the standardization of GGI&S data, products, and information worldwide.

FMS is a flexible, customer-oriented program. Many partner countries must be selective in what they wish or are able to procure as a result of constraints imposed upon them. Some restrictions include funding limitations, human resources, and importation laws. FMS enables DMA to assist in establishing a program tailored to the unique requirements of the country. As an example, a country can request that DMA provide its expertise (either through DMA or contractor resources) and perform a study to identify and validate requirements, to train personnel, or integrate, set up, or maintain the systems or equipment procured through DMA or via another source.



### Digital Nautical Chart (DNC)

In December 1994, DMA successfully completed a four-year FMS case with the United Kingdom. The project involved acquisition, development, and activation of a modernized production system. In an unprecedented collaboration, the United States and the United Kingdom kicked off a new era of joint cooperation and coproduction. Currently, DMA is managing a comprehensive follow-on support FMS case to provide maintenance, technical support, training, and engineering improvements to the United Kingdom's production system.

### Foreign Lease/Loan

As authorized under current U.S. laws, the Defense Mapping Agency responds to requests of eligible foreign governments and international organizations for the lease or loan of DMA MC&G equipment to mapping agencies throughout the world. Lease of DMA property is governed by the Arms Export Control Act, (AECA), as amended, and applicable FMS regulations, laws, and policy, and requires reimbursement by the foreign government. Loan of MC&G equipment is governed by the Foreign Assistance Act (FAA) of 1961, as amended.

Prior to approval, DMA must determine if the proposed lease or loan meets U.S. law and security assistance criteria. In addition, DMA must ensure that the MC&G equipment will not be required for or interfere with its ongoing production programs. Ultimately, the lease or loan must be of benefit to the U.S. Government and serve the public interest by providing a quid-pro-quo return in the form of reimbursement, unique data, maps or charts from the foreign government, or international organization.

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Additional conditions which must be met before a lease or loan may be effected include agreement by the borrower that the U.S. will retain title to the system or equipment. All transportation costs to and from the delivery site are borne by the borrower. The system or equipment must be maintained as in condition received, and reimbursement must be made to the U.S. government for any damage, loss or destruction.

DMA currently has international loan agreements with approximately 40 countries throughout Central and South America, Asia, Europe, and Africa. An example of a major DMA security assistance loan program in South America is that with Bolivia whereby, through the loan of equipment and training of Bolivian personnel, DMA receives Bolivian-generated MC&G data and products for use in conjunction with joint U.S./Bolivian counternarcotics operations.

Various GGI&S systems and equipment have been leased and loaned to foreign governments and international organizations, subject to availability. These include navigation satellite receivers, global positioning systems, offset presses, and LaCoste-Romberg gravity meters. Requests for equipment lease or loan are subject to review to ensure benefits accrue to the U.S. government.

### **International Military Education and Training**

The International Department of DMA's Defense Mapping School (DMS) provides GGI&S training to countries with coproduction agreements with the United States for production and exchange of cartographic information. DMA's training program assists the customer in understanding how best to use DMA products. Some training classes are held in residence at the school. However, the majority of training is provided by Mobile Training Teams (MTT) at the foreign site, providing convenience and affordability of on-site training to the foreign customer.

Some of the requirements supported by the MTT's include Basic Cartographic Production, Joint Operations Graphic (JOG) Specifications, Map Maintenance, 1:50,000 Topographic Line Map Specifications, Nautical Cartography, and Photo Interpretation.

During 1995, DMS provided training to over 200 foreign military and civilian students, from over 21 countries. In addition, MTT's visited 15 countries, providing support to WGS-84 implementation in Korea and training to students in some of the newly emerging democracies, including Albania, Czech Republic, Estonia, Hungary, Latvia, Poland, and Romania. Strong support to Central and Latin America continues through training provided to Costa Rica, Dominican Republic, Honduras, and South American countries such as Bolivia, Peru, and Venezuela. Resident training in digital production techniques have included students from Chile, Colombia, and Thailand.

DMS training covers a wide spectrum of cartographic production, ranging from classical, i.e., manual production techniques, to state-of-the-art applications and equipment used in an all-digital production environment.

Resident training at DMS is comprised of six to eight week courses, covering digital production techniques using systems in the Digital Production and Photogrammetry Laboratories of the International Department.

DMA's Defense Mapping School is a recognized leader in providing professional military training in Cartographic disciplines. By updating the skills and production techniques of the international community, closer ties, and improved international relations are brought about

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between the United States and coproducer nations. These ties contribute to DMA's goal to achieve standardization of global mapping, charting, and geodesy information, products, and techniques which are of significant benefit to both the coproducer and the United States.

## **Other Programs**

### **Peacekeeping and Humanitarian Operations**

DMA's participation in peacekeeping and humanitarian operations is notable for its exemplary contributions during military operations such as Operations DESERT STORM and DESERT SHIELD, Haiti, Bosnia and the former Yugoslavia, and in humanitarian and disaster relief efforts such as Rwanda and Somalia. More than 54 million aeronautical maps and 640,000 point positioning database (PPDB) elements were produced during the Persian Gulf War by DMA's St. Louis, Missouri complex. The DMA Bethesda, Maryland complex produced more than 67 million copies of 2,300 hydrographic and topographic maps and charts in just eight months during 1990-91. The Agency's Philadelphia Depot distributed over 93 million MC&G products during the period to U.S. and allied military forces.

In November 1995, DMA played a historic role during the Bosnia Peace Talks held in Dayton, Ohio. Led to Dayton by DMA Director Maj. Gen. Philip W. Nuber, 55 support personnel accompanied by more than \$4 million in high-tech equipment provided round-the-clock mapping support to the negotiators. The majority of the mapping effort resulted from the shifting of the inter-entity and cease-fire lines. The negotiators asked to see the changes each time they occurred. DMA employed a prototype PowerScene™ terrain visualization system, using DMA imagery and digital terrain elevation data to produce three-dimensional views of a selected region in real time. As a result, mapping support personnel were able to show the changes on screen and on paper, providing an on-site complete end-to-end mapping operation.

### **Excess Defense Articles (EDA)**

The Agency's EDA program permits the transfer of excess defense mapping and charting equipment to eligible countries in support of their developing MC&G capabilities. The equipment transfers have been made primarily to countries in Central and South America and implemented through the Defense Security Assistance Agency. The program has proven extremely beneficial and cost effective to DMA in that the donated equipment has enabled these countries to produce information and data of sufficiently high value and quality for utilization in DMA production. The equipment is excessed and transferred to the foreign country on site. All maintenance, upgrade, follow-on support, and transportation costs are borne by the receiving country.

## **CONCLUSION**

As a high achiever, DMA constantly strives for excellence. In the arena of security assistance, DMA has set and attained precedent-setting goals for bringing quality global geospatial information and services and digital mapping technology to the forefront through international coproduction and partnerships. The Agency's international programs, such as International Exchange and Coproduction, Foreign Military Sales, Lease/Loan, and International Military Education and Training, have helped developing countries build mapping capabilities not only of consequence for meeting their own needs, but to those of the world mapping community at large.

Through FMS requests from eligible nations, DMA conducts systems engineering and technical evaluation analyses; systems and equipment procurement, integration, and interface;

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development, enhancement, and improvement of MC&G capabilities. Through training on-site and at DMS, foreign students acquire the capability and skill to utilize DMA products and cartographic production equipment in an all-digital environment. The Agency's Lease/Loan program enables these nations to supplement their production mapping equipment with DMA equipment, since in the majority of cases, they would not have the financial resources to purchase it.

The production of traditional paper maps and charts and precise geodetic data, or MC&G products and services, is rapidly bowing to Global Geospatial Information and Services (GGI&S). Recognizing the need for change led DMA to review its mission, priorities and business practices.

DMA has embarked on a active course to meet the challenges of the new digital technology and the changing world order, and to continue to lead the world's mapping community. The reinvented DMA creates an environment moving away from hard copy products to digital data bases, to migrate rapidly away from being a distributor of shelved inventory to a provider of geospatial information and services.

The concepts of reinvention showcase a Defense Mapping Agency that connects with its customers and sets new standards for readiness and responsiveness in delivering superior geospatial products, services, and information.

In preparing for the future, DMA is committed to continuous improvement. It constantly strives to become more productive, efficient, and effective, to provide the nation with the best return on the resources entrusted to it. DMA is an active national and international partner in the total defense effort to identify and respond to emerging strategic issues to shape a more desirable future.

The results of the quality initiatives in the Defense Mapping Agency are not measured in terms of honors or awards, but rather on the lives saved on the battlefields. DMA's work force, always the Agency's most important asset, realizes that DMA's quality future depends on the participation of everyone. The greatest rewards come in the form of customer comments, such as in the case of downed pilot Captain Scott O'Grady who signed a DMA escape and evasion chart with, "To the Defense Mapping Agency, Thank you and God bless!"

#### **ABOUT THE AUTHOR**

Richard A. Tanzillo is program manager for Foreign Military Sales at the Defense Mapping Agency. He holds a BEE from Pratt Institute, Brooklyn, NY and an MSE from Catholic University of America, Washington, DC. His involvement in security assistance began in 1980 as a program manager with the U.S. Navy's Saudi Naval Expansion and Saudi Naval Support Program Offices. He joined DMA in 1987 and, in addition to FMS, currently manages the Foreign Lease/Loan Program. For further information regarding the DMA FMS program or to request equipment lease or loan, please contact him at the Defense Mapping Agency, Attention: OGIG/Mail Stop A-20, 8613 Lee Highway, Fairfax, VA 22031-2137, (703) 275-8522 (DSN 235-8522), or send Internet e-mail via "tanzillr@dma.gov".